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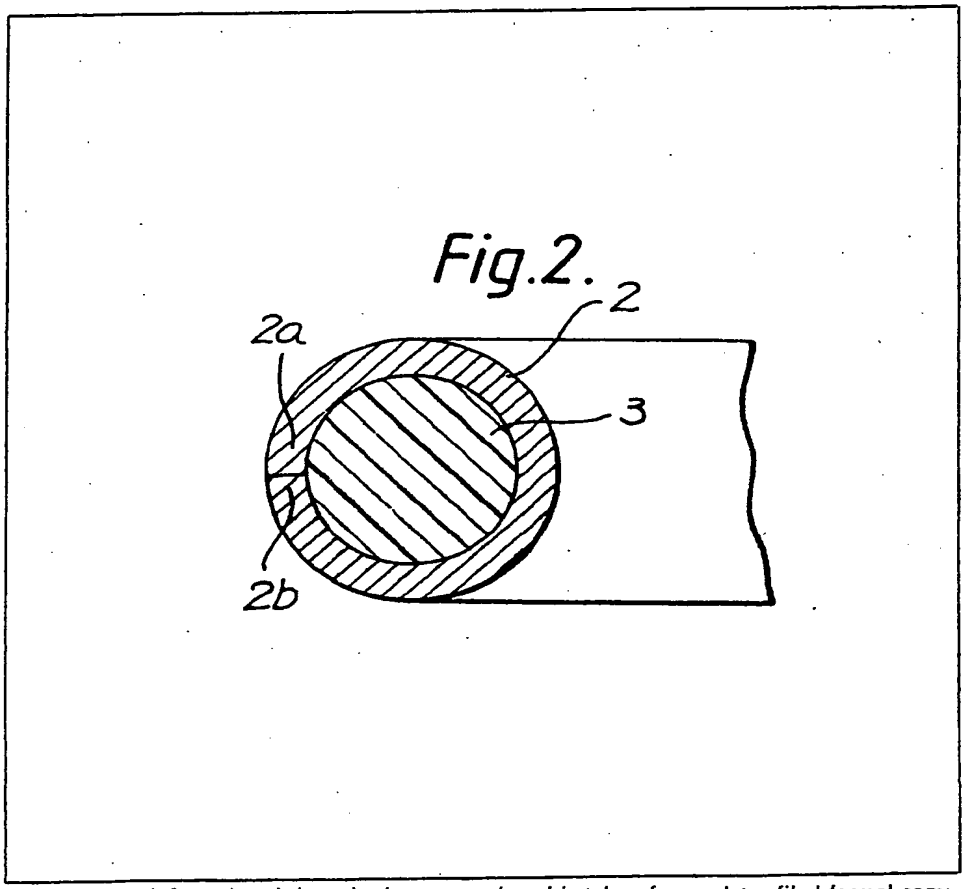
(54) A sealing element

(57) A sealing element comprises a ring-shaped outer metal jacket (2) having a circular radial cross-section and edges (2a and 2b) extending along a seam of the jacket. A filler material (3) is mechanically supported and hermetically sealed in the metal jacket, thereby preventing extrusion of the filler material and preventing penetration of chemically reactive agents to the filler material. In some embodiments the metal jacket is hermetically sealed by sealing the seam edges of the jacket together. In other embodiments, the filler material is received in an inner metal jacket which is sealingly enclosed by the outer metal jacket.



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The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

Fig.1.

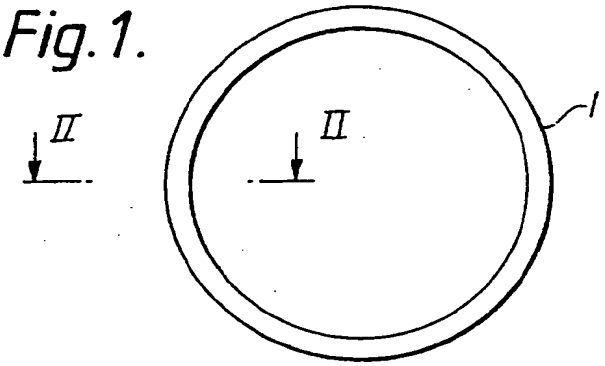


Fig.2.

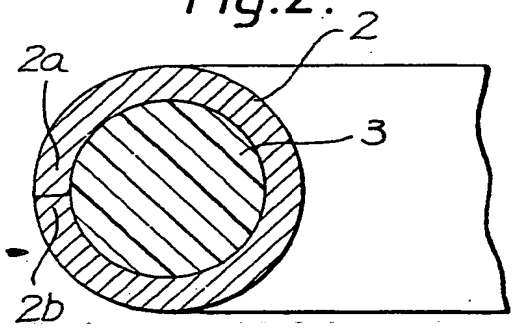


Fig.3.

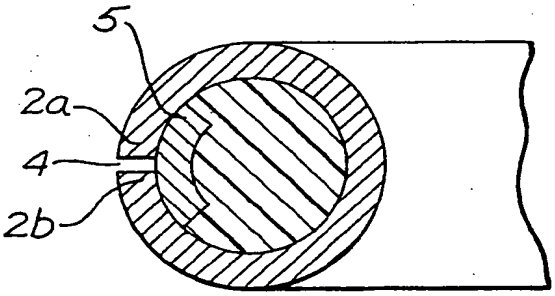


Fig.4.

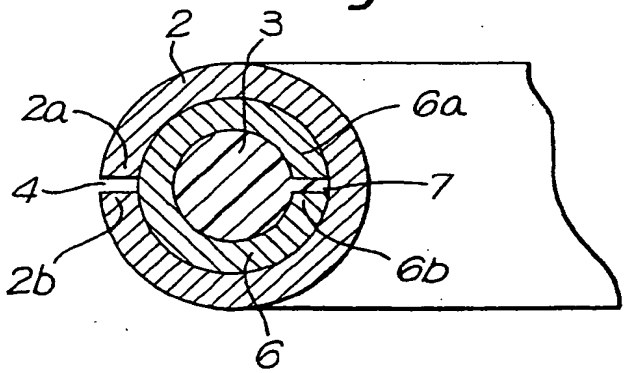


Fig.5.

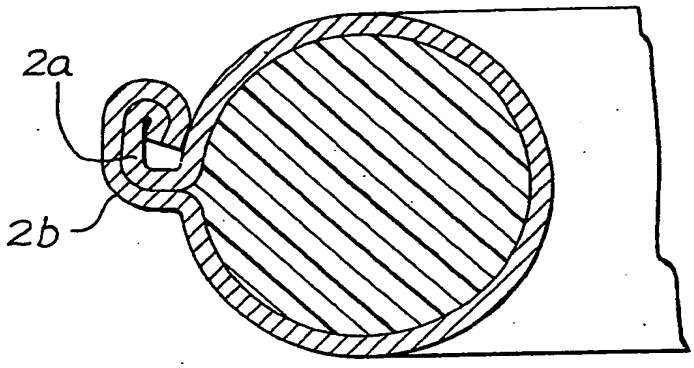


Fig.6.

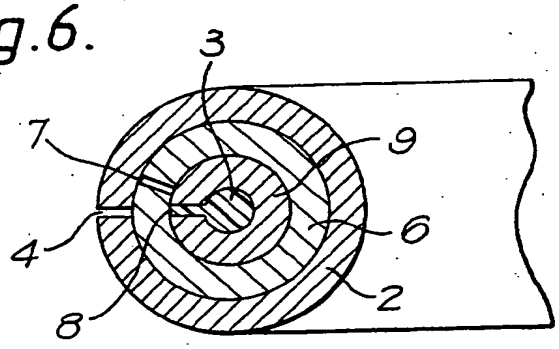
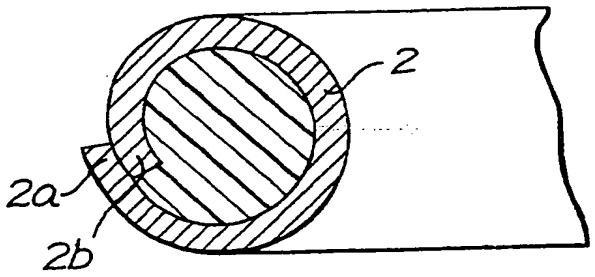


Fig.7.



SPECIFICATION

A sealing element

This invention relates to improvements in or relating to sealing elements comprising a metal jacket containing a filler material.

In known sealing elements of this kind, e.g. filled sealing rings, type C, according to DIN 7603, the metal jacket does not fully enclose the filler material either when supplied or when installed, so that the filler may come into contact with the media to be sealed and the structural components as well as the atmospheric environment When known sealing rings of this kind are used to seal joints which are exposed to high thermal stress, satisfactory sealing usually is not achieved because the temperature resistance of the filler materials used is too low, i.e. at high operating temperatures the materials are subject to oxidation and so lose their sealing effectiveness.

An all-metal seal, e.g. solid metal ring, cannot be used because of the low recovery characteristics of the metal, as defined by the elasticity module, which results in thermal dilatation of structural components.

While structurally elastic metallic sealing elements, such as embossed metal gaskets, exhibit high recovery properties at room temperatures, practically all these properties are lost at high temperature due to thermal relaxation.

Therefore, an object of the invention is to provide a sealing element that can withstand high temperatures and is chemically resistant.

According to the present invention, there is provided a sealing element comprising a metal jacket containing a filler material, in which element the filler material is mechanically supported and hermetically sealed in the jacket, thereby preventing extrusion of the filler material and penetration of chemically reactive media to the filler material during use of the element.

In one form of the invention, the metal jacket is hermetically sealed by sealing two edges of the jacket together along a seam. For example, in one embodiment, the seam edges of the metal jacket are butted together and joined. In another embodiment, the seam edges of the metal jacket are sealed together by a metal sealing strip extending along the seam, the metal sealing strip preferably being disposed inside the metal jacket between the filler material and the metal jacket. In a further embodiment, the seam edges of the metal jacket are outwardly flanged and crimped together. In yet another embodiment, the seam edges of the metal jacket are overlapped and sealed together, the overlapped seam edges preferably overlapping over a circumferential angle of not more than about 45°.

In another form of the invention, the filler material is received in an inner metal jacket which is enclosed by an outer metal jacket.

If desired, the filler material may be received in an innermost metal jacket which is enclosed by an intermediate metal jacket which is itself enclosed by an outer metal jacket.

Conveniently, each of the metal jackets has two adjacent edges thereof extending along a seam, the seams of adjacent jackets being staggered relative to one another to provide hermatic sealing of the filler material within the jackets.

Desirably, the metal jacket or jackets are of adequate thickness to protect the sealing element from mechanical damage prior to or during use.

In a preferred application of the sealing element, the element is ring-shaped and has a substantially circular cross-section.

The filler material may comprise an elastic or plastic gasket material, such as graphite, asbestos and/or clay.

Due to the construction of a sealing element embodying the invention the filler material is neither in contact with the medium to be sealed nor with the structural components nor the ambient atmosphere. Consequently, the filler material is protected from extraneous influences. For example, a material normally subject to oxidation in a normal environment at high temperatures, like graphite, will maintain its good recovery characteristics at room temperature as well as at very high temperatures. For this reason, a sealing element embodying the invention has proven its outstanding performance in actual use on joints which are subject to high temperatures, e.g. sealing applications on exhaust turbocharger flanges.

In order that the invention may be readily understood, embodiments thereof will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a plan view of a ring-shaped sealing element embodying the invention;

Figure 2 is a radial cross-sectional view of part of the sealing element of Fig. 1 taken on the line II–II of Fig. 1; and

Figures 3 to 7 are cross-sectional views similar to Fig. 2 of various other embodiments of a sealing element in accordance with the invention.

Referring now to the drawings, Fig. 1 shows a ring-shaped sealing element 1 embodying the invention, designed for use on joints subject to high temperature stress, for example exhaust turbocharger flanges, or joints requiring high resistance to chemical attack at high temperatures.

As shown in Fig. 2, the sealing element of Fig. 1 is of circular radial cross-section and comprises a toroidal body of a filler material 3 sealingly encased by an outer metal jacket 2. The two edges 2a, 2b extending along a seam of the jacket 2 are butted and joined together

so as hermetically to enclose the filler material within the metal jacket 2.

The filler material 3 comprises an elastic or plastic gasket material (preferably composed by graphite, asbestos and/or clay). The performance of the sealing elements has been tested and proven in practical applications in sealing exhaust turbocharger flanges, the annular sealing ring having inner diameter of approximately 45.3 mm and an outer diameter of approximately 51.9 mm for this particular purpose.

In the embodiment shown in Fig. 3, the filler material is shaped to allow a contact area or seam 4 between the two edges 2a, 2b of the outer metal jacket to be hermetically sealed by an inner metal sealing strip 5 which extends along the seam and, as shown in Fig. 3, bridges the edges 2a, 2b at the seam 4.

Fig. 4 shows another embodiment of a sealing element in accordance with the invention, in which an additional inner metal jacket 6 is disposed immediately inside the outer metal jacket 2. The filler material 3 is contained within the inner jacket 6 contacting the inner surface of the metal jacket 6 and extending into a gap left at the seam 7 between edges 6a and 6b. The outer metal jacket 2 is sealingly arranged around the inner metal jacket 6 such that the respective seams 7 and 4 do not coincide. As shown in Fig. 3, the seam 7 is diametrically opposite the seam 4.

A further embodiment of a sealing element in accordance with the invention is illustrated in Fig. 5, wherein the single outer metal jacket 2 has seam edges 2a, 2b which are outwardly flanged and crimped together.

As shown in Fig. 6, another sealing element embodying the invention is formed with three concentric metal jackets. The filler material is received within and extends into the seam 8 between the two edges of an innermost metal jacket 9, around which an intermediate inner metal jacket 6 is sealingly disposed. The intermediate metal jacket 6 is similar sealingly engaged within the outer metal jacket 2. The metal jackets 9, 6 and 2 are arranged around the filler material such that the respective seams of adjacent metal jackets are in staggered, non-overlapping relationship, although as shown in Fig. 6 the seam 8 of the innermost metal jacket 9 is radially aligned with the seam 4 of the outer metal jacket 2.

Fig. 7 illustrates a sealing element embodying the invention and including a single outer metal jacket 2 formed sealing-tightly around the filler material 3. The edges 2a and 2b of the jacket overlap and are resiliently prestressed to form a tight seal, the degree of overlap being such that the overlap area subtends an angle of not more than approximately 45° at the part which would form the centre of the cross-section were the cross-section circular. The overlap may subtend an angle of between 10° and 45° and preferably between 20° and 30°.

Each of the embodiments described above is provided with a jacket or jackets of adequate thickness to prevent mechanical damage prior to as well as during use of the sealing element.

The filler material 3 is so tightly enclosed within the metal jacket or jackets that damage by extraneous external conditions, for example oxidation caused by contact with air, is prevented and the filler material retains the good recovery characteristic inherent therein, resulting in a high operating reliability and long life for a sealing element embodying the invention.

Advantageously, the filler material 3 is provided in a pressed form conforming to the internal cross-sectional shape within the metal jacket or jackets in each embodiment as shown in Figs. 2 to 7.

CLAIMS

1. A sealing element comprising a metal jacket containing a filler material, in which element the filler material is mechanically supported and hermetically sealed in the jacket, thereby preventing extrusion of the filler material and penetration of chemically reactive media to the filler material during use of the element.

2. A ~~sealing element according to~~ claim 1, wherein the metal jacket is hermetically sealed by sealing two edges of the jacket together along a seam.

3. A sealing element according to claim 2, wherein the seam edges of the metal jacket are butted together and joined.

4. A sealing element according to claim 2, wherein the seam edges of the metal jacket are sealed together by a metal sealing strip extending along the seam.

5. A sealing element according to claim 4, wherein the metal sealing strip is disposed inside the metal jacket between the filler material and the metal jacket.

6. A sealing element according to claim 2, wherein the seam edges of the metal jacket are outwardly flanged and crimped together.

7. A sealing element according to claim 2, wherein the seam edges of the metal jacket are overlapped and sealed together.

8. A sealing element according to claim 7, ~~wherein the seam edges overlap over~~ a circumferential angle of not more than about 45°.

9. A sealing element according to claim 1 or 2, wherein the filler material is received in an inner metal jacket which is enclosed by an outer metal jacket.

10. A sealing element according to claim 1 or 2, wherein the filler material is received in an innermost metal jacket which is enclosed by an intermediate metal jacket which is itself enclosed by an outer metal jacket.

11. A sealing element according to claim

9 or 10, wherein each of the metal jackets has two adjacent edges thereof extending along a seam, the seams of adjacent jackets being staggered relative to one another to provide hermetic sealing of the filler material within the jackets.

12. A sealing element according to any preceding claim, wherein the metal jacket or jackets are of adequate thickness to protect the sealing element from mechanical damage prior to or during use.

13. A sealing element according to any preceding claim, wherein the element is ring-shaped.

14. A sealing element according to claim 13, wherein the element has a substantially circular cross-section.

15. A sealing element according to any preceding claim, wherein the filler material comprises an elastic or plastic gasket material, such as graphite, asbestos and/or clay.

16. A sealing element substantially as hereinbefore described with reference to, and as illustrated in, the accompanying drawings.

17. Any novel feature or combination of features herein disclosed.

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